

China's Threat and Opportunity for Thai and Vietnamese Motorcycle Industries: A Sectoral Innovation System Analysis

Patarapong Intarakumnerd, Ph.D.¹ and Mai Fujita²

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1. Introduction

At present, sector is a key level of analysis for both academics and policy makers. Related to several theoretical traditions such as innovation system approach, evolutionary theory, industry life cycle analysis and others, the concept of sectoral system of innovation and production is better than mainstream industrial economic analysis such as structure, conduct and performance, game theory and transaction cost analysis, as it provides a broader- and longer-term view on the evolution and dynamics of sectors. A sectoral system of innovation and production is a set of new and established products for specific uses and the set of agents carrying out market and non-market interactions for the creation, production, and sale of those products. Sectoral systems have a knowledge base, technologies, inputs and demand. The agents are individuals and organizations at various levels of aggregation, with specific learning processes, competencies, organizational structure, beliefs, objectives and behaviors. They interaction through processes of communication, exchange, cooperation, competition and command, and their interactions are shaped by institutions. A sectoral system undergoes processes of change and transformation through co-evolution of its various elements (Malerba, 2002). The concept may be used to analyze sectors in several aspects, namely, for better understanding of the working, dynamics and transformation of sectors, for the identification of the factors affecting performance and competitiveness of firms and countries, and for the development of new public policy proposals.

Albeit useful, the concept needs further development, especially the verification and elucidation from more empirical research. One of important field of research in this area is to study how and why sectoral systems of innovation and production in the same industry but different countries differ from each other, i.e., their differences in terms of learning processes, technologies, input, demands, types and structures of interaction of players in the sector, underlying institutions and sector's evolution. This paper will shed a light on this very important issue. A special attention will be paid to how sectoral systems of innovation and production in the same industry but across countries may evolve

¹ Project Manager of Thailand's National Innovation System Study, National Science and Technology Development Agency (NSTDA), 73/1 Rama VI Road, Bangkok, 10400, Thailand, patarapong@nstda.or.th Tel. +6626448150-4 ext. 364. Fax: +6626448194

² Researcher, Southeast Asian Studies II Department, Area Studies Center, Institute of Developing Economies, Japan External Trade Organization, 3-2-2 Wakaba, Mihama-ku, Chiba 261-8545, Japan, fujita@ide.go.jp, Tel +81-43-299-9588, Fax +81-43-299-9729.

differently after facing similar threats and opportunities caused by the same external factor. To elaborate on this, we will use the case of evolution of the automotive sectors in Thailand and Vietnam and their dynamics and transformation when they are facing threats and opportunities from their fierce competitor, China.

2.1 Overview of Motorcycle Industries in Thailand and Vietnam and Threats and Opportunities from China

Threats and Opportunities from China is probably one of the most popular topics for Asian academics and policy makers. Members of Association of South East Asian Nations (ASEAN), in particular, are very much concerned with the rise of China. China is seen as both a threat and an opportunity for ASEAN. Obviously, China's huge market is very attractive for export and investment from ASEAN. Chinese tourists, increasing rapidly, are one of main target groups of ASEAN's tourism promotion authorities. Several Chinese large conglomerates have invested in heavy industries and energy sector in ASEAN. At the same time, for second-tier Newly Industrialising Countries (Thailand, Malaysia, Indonesia and the Philippines), China is a fierce competitor in their key industries such as automotive, electronics, textile and garments, and so on. For ASEAN's members which are transitional economies (Vietnam, Lao, Cambodia), the rise of China can be viewed even more problematic, as it strongly affects efforts by these countries to industrialise and build up their indigenous technological capabilities. Not only opportunities for their export-led industrialization strategies lately started have been compromised by Chinese goods, their import-substitution strategies are in jeopardy because of flooding of Chinese consumer and industrial goods.

On the global scale, motorcycle industry is a mid-tech and rather technologically mature industry. Automotive sector of several Asian latecomer economies started with assembling motorcycles and producing their parts by using imported technologies. Within ASEAN, Thailand and Vietnam are large producers with the production capacity of 3.5 million (Thai Automotive Institute, 2006) and 2 million (General Statistics Office, 2006) respectively in 2005. In both countries, markets are basically dominated by Japanese TNCs. Local companies are suppliers, especially second- or third-tier ones. Some of them, especially at the first tier, are joint ventures with foreign component makers.

Motorcycle industry is also a typical example if the industry where China's threat on other Asian countries has been enormous. China is the largest producer as well as the largest market of motorcycles in the world. In 2004 the country produced over 17 million motorcycles, 3.9 million of which were exported overseas (China Automotive Technology & Research Center and China Automotive Industry League, 2005). Chinese motorcycle industry is dominated by local companies that boast competitive advantage in mass production of low-priced products. Since the end of 1990s harsh competition at home has driven many Chinese motorcycle assembling companies to search for export market. The "export drive" of Chinese motorcycle companies has been perceived as a serious threat to motorcycle manufacturers in the region as well as the rest of the world, though its actual impact has varied from country to country.

2.2 Methodology

The studies of motorcycle industries in Thailand and Vietnam were conducted separately but in the same year of 2004. The study in Thailand was commissioned by National Science and Technology Development Agency (NSTDA) to the College of Technology and Innovation Management, King Mongkut's University of Technology Thonburi (KMUTT). Though its main focus is on the Tiger Motorcycle (a pure Thai groups of companies) cluster, the study also analyzes and synthesizes motorcycle industry as a whole in Thailand by exploring the roles and capabilities of main agents (both firm and non-firm), their linkages and learning processes. The analysis of Thai motorcycle industry was drawn from the data from the questionnaire surveys and in-depth interview. One hundred and one questionnaires to relevant agents (mainly part suppliers) in the industry were sent with the return of 40 %. Together with the survey, ten interviews were conducted to explore at length the characteristics, linkages, activities, and interactions of key agent in the industry. Apart from the study, this paper rely on other secondary sources of information such as industry reports and government plans, and notes from conversation with main senior government officials and companies' executives.

The study on Vietnam was conducted within the framework of research project "Motorcycle Industry in Asia" by the Institute of Developing Economies (IDE) during 2004-2005. IDE commissioned a survey of motorcycle and parts companies in Vietnam to the Vietnam Institute of Economics, Vietnam Academy of Social Science (VIE-VASS), for which VIE-VASS conducted questionnaire surveys of 40 companies, including local and foreign (Taiwanese, Korean and Chinese) motorcycle and parts companies. The author, in collaboration with VIE, also conducted 10 of the surveyed companies to obtain qualitative information on the companies' development process and current operations. In a separate attempt, the author conducted in-depth interviews with Japanese motorcycle and parts manufacturing companies in Vietnam, Thailand and China. In 2005, the author conducted follow-up interviews with some of the local and foreign (Japanese and Taiwanese) companies.

2.3 The Motorcycle Sectoral Innovation Systems in Thailand and Vietnam

This section analyzes and compares elements of motorcycle sectoral systems of innovation and production of Thailand and Vietnam. These basic elements will be explore: products, agent (types, interactions and learning processes), and institutions (e.g. norms, routines, laws, regulations, standard) that shape agents cognition ad action and affect the interaction among agents.

3. 1 Products

According to size of engine, motorcycle can be classified into 4 types: small (50cc-250 cc), medium (251cc-750 cc), large (751 cc-1199cc) and very large (1200cc or more). Application-wise, there are also 4 types: standard motorcycle (small, simple, economical and easy to use), performance motorcycle (normally equipping with engine of more than 251 and mostly for racing), styling/touring/luxurious motorcycle (normally with medium

or large engine), and individual owner customization motorcycle (normally with large engine) (see Kosnik, 1995).

Motorcycles produced and used in developing countries including Thailand and Vietnam usually belong to the standard type with economical price and small engine (125 cc. or below). This segment has two prominent characteristics: (1) the use of mature technology, and (2) the dominance of Japanese motorcycle companies. In business motorcycle segment, Honda's "Supercub" equipped with C100 engine still remains the dominant model. C100 was developed back in the 1950s, and its basic technology has not gone through any major innovations for the past 30 to 40 years. Yet, the models developed on the basis of C100 still keep an overwhelming market share, though individual models are adjusted to meet local conditions such as climate, road conditions, and preferences of consumers (Ohara 2006a, 2006b). Reflecting the proprietary advantage in technology, brand, and distribution channels, along with the "dominant model," Japanese motorcycle companies and especially Honda hold an overwhelming share in the economical business motorcycle segment at the global scale (Ohara 2006b)

Motorcycle units can be classified to two types: Completely Build Unit (CBU) and Completely Knock-Down (CKD) unit (a complete set of all parts ready for assembling). Many developing countries start import substitution of CBUs by simple assembly of imported CKD units, followed by the stage where the government policies force the domestic assembling companies to increase the local content ratio of the motorcycles. Motorcycle industries in both Thailand and Vietnam followed this development path.

There are also motorcycle parts. Important parts are body part, exhaust system/filter/fuel system, drive/transmission and steering parts, engine part, suspension/brake/wheel, and instrument and seal. In terms of models produced by Japanese motorcycle companies, the majority of the parts are "custom-made parts" specifically produced according to the specifications of the motorcycle company³. In contrast, Chinese motorcycle companies have imitated the base models developed by Japanese motorcycle companies, including C100, often providing some "minor changes" (Ohara 2006a). This is also the case of Thai motorcycle companies. In China, the base models and engines are shared by companies in the entire industry, and for parts that do not require either originality in appearance design and technology or high accuracy and high quality, ready made parts available in the market are widely utilized (Ohara 2006a). Such market-based transactions also prevail in procurement networks of Vietnam's local motorcycle companies, which started with simple assembly of Chinese parts.

3.2 Agents: Types, Interactions and Learning Processes

The main agents of the sector in the two countries are both firms (namely, own-brand manufacturers and part suppliers) and non-firms such as education institutes, research institutes, government sector-specific regulatory and supporting institutes). This section outlines the main agents of the sectors in the two countries prior to China's export drive.

³ Otahara (2006) notes that 90% of the motorcycle parts that motorcycle companies procure from parts manufacturers are specifically designed for each model.

Firms

Japanese TNCs which are Own-Brand Manufacturers (OBMs) play significant roles in both countries. Thailand, however, has longer history of producing motorcycles locally. Japanese TNCs have invested in the countries since 1960s, while investment in Vietnam started in the mid-1990s. Each TNC (Honda, Suzuki, Yamaha, and Kawasaki) has developed its own networks of suppliers. In 2004, Honda had the largest market share of 72%. For suppliers, in total, there were 323 suppliers in Thailand, 122 of which supplied to both automobile and motorcycle producers (GMI, 2004). First-tier suppliers are usually medium-size firms and joint ventures between foreign firms (especially Japanese) and Thai entrepreneurs. They used to be Original Equipment Manufacturers or OEMs. However, due to global sourcing strategies of TNCs (sourcing parts and components from any supplier worldwide provided that TNCs' demanded specifications and prices are met) since mid 1990s, they were forced to continuously improve efficiency and develop their design capabilities and, thereby, becoming Own-design Manufacturers or ODMs⁴ (Intarakumnerd et.al., 2002). The second-and third-tier (OEMs) suppliers are usually Thai companies with small factories and limited technological capability and number of employees. They sell motorcycle parts to the first-tier suppliers. Some part makers, the so-called Replacement Equipment Manufacturers (REMs), instead, focus on selling parts in replacement markets locally and abroad. Some part makers are both OEMs and REMs. Suppliers in Thailand have longer experiences in learning and accumulating technological capabilities than those in Vietnam. Apart from engine and gear which require highest technological capabilities, other components can be made locally. In Thailand there are two emerging pure-Thai OBM companies producing motorcycles with their own brand, distributing channels, and networks of suppliers. Started in 2000, Tiger Motor became the fourth largest producer of motorcycles in Thailand with the market share of 3 per cent (see Table 1). This pure-Thai firm has an aim of not only having its own brand but trying to build and upgrade technological capabilities of a network of pure-Thai suppliers under the slogan "Tiger, Pure-Thai Motorcycle". However, in practice, Tiger still has to seek technologically-sophisticated parts from Japanese joint ventures in Thailand. Another is a group of Thai suppliers, SME 007 Plus. They began with supplying motorcycle parts to Japanese TNCs and selling their products in replacement markets both in Thailand and abroad. With five core companies, the network of almost 100 SMEs have been built. They have jointly developed a few motorcycle parts (e.g. chain and choke) and selling them under the co-brand "SME 007 Plus" They expanded their distribution network to cover repair shops all over Thailand. Recently, they teamed up with a Thai electrical appliance, DiStar, which has financial strength and extensive distribution network, to produce a prototype of the whole motorcycle, initially expected to be sold in 2006.

There are also companies which are capital goods (mostly engine) suppliers to motorcycles assemblers and part makers. Local capital goods industry in Thailand is relatively weak. Most types of engines are, therefore, imported from abroad. The linkages

⁴ OEM and ODM are specific forms of subcontracting. Under Original Equipment Manufacture (OEM), a latecomer firm produces a finished product to the precise specification of a foreign transnational corporation (TNC), which will market under its brand name via its own distribution channels. Under Own-Design Manufacture (ODM), a latecomer firms also carries out some or all of the product design (Hobday, 1995: 37).

between producers in motorcycle industry and their capital good suppliers are only limited to market transaction and advice on how to ‘operate’ machine. There is virtually no knowledge exchanges leading to technological upgrading (GMI, 2006).

Table 1. Market Share of Motorcycle Industry in Thailand in 2003

Company	Year of Establishment	Market Share
Thai <i>Honda</i> Manufacturing	1965	72%
Thai <i>Suzuki</i> Motor	1968	13%
Thai <i>Yamaha</i> Motor	1966	10%
<i>Tiger</i> Motor	2000	3%
<i>Kawasaki</i> Motors (Thailand)	1976	2%

Source: GMI, King Mongkut University of Technology Thonburi (2004)

Motorcycle industry in Vietnam started to develop only in the early to mid-1990s, when the Vietnamese government launched import substitution policy of motorcycles by erecting trade barriers and providing incentives for foreign direct investment. By the late 1990s, the major motorcycle companies in Vietnam included: one Taiwanese TNC (VMEP, a subsidiary of Taiwan’s Sanyang Motors⁵) and three Japanese TNCs (Suzuki, Honda and Yamaha) (Table 2). Some Taiwanese and Japanese parts manufacturers followed the motorcycle companies to invest in Vietnam, producing such parts as tyres, batteries, electric parts, brakes, and plastic parts. The number of Taiwanese suppliers that initially followed Sanyang amounted to 13 (Chen and Jou 2002). The number of Japanese suppliers was smaller, reflecting the small market size and unstable investment environment in the mid-1990s. The number of local parts suppliers was even more limited. Although there were numerous local companies producing replacement parts, they were outside the procurement networks of foreign motorcycle companies. The reasons are two-fold: the foreign motorcycle companies were not compelled to increase the local content ratio at this stage, and they regarded the technological level of local parts companies as too low. Apart from a few state-owned machinery companies that started to produce parts for Honda Vietnam in the late 1990s, virtually no local parts suppliers participated in the procurement network of the TNCs. As of the late 1990s, Japanese motorcycle companies depended largely on parts produced in-house and parts imported from abroad, especially Thailand.

Table 2. Major Foreign Motorcycle Companies in Vietnam

Company	Year of license	Ownership structure
Vietnam Manufacture & Export Processing Co., Ltd. (VMEP)	1992	Taiwan (100%)
GMN Automobile & Motorcycle Parts Manufacture JV Co., Ltd. (GMN)	1995	JV (Thailand, Laos, Vietnam)

⁵ Chinfon Group, the parent company of Sanyang Motors, holds 100% stake in VMEP.

Vietnam Suzuki Corp.	1995	JV (Japan, Vietnam)
Honda Vietnam Co., Ltd.	1996	JV (Japan, Thailand, Vietnam)
Yamaha Vietnam Co., Ltd.	1998	JV (Japan, Malaysia, Vietnam)
Lifan Motorcycle Manufacturing JV Co.	2002	JV (China, Vietnam)

Note: JV stands for “joint venture.”

Source: Survey by the Vietnam Institute of Economics, Vietnam Academy of Social Science in 2004, author’s interviews.

Government

Apart from firms, differences in roles played by non-firm agents contribute to differences of the evolution of the two countries’ sectoral system of innovation and production. The Thai government, for the first-time in the history of the country’s industrial policy, has selective policies under Thaksin administration, which started in 2001 (see Intarakumnerd, 2006). The government has an aspiration to make Thailand the Detroit of Asia i.e., to be a global center for producing car, motorcycle and automotive part. It sets a clear target for the country to produce 10 million cars by 2010. To realize this mission, the ten-year National Science and Technology Strategic Plan (2004-2013) aims to produce 1,000 researchers, and 4,000 specialized engineers in automotive industry (National Science and Technology Policy Committee, 2004).

Implementation of these government plans by concerned agencies is still far from being coherent and synergistic (Institute of Intellectual Property, 2006:29). However, there is a specific organization responsible for development of the country’s automotive industry. The Thai Automotive Institute was set up as an independent public organization under the Ministry of Industry in 1988. It aims to operate like a private-sector organization with high level of flexibility and efficiency. The main objective is to be the centre for supporting development of the Thai automotive sector to be a main exporting base in the world. The institute has broad functions. It plays an important role in formulating policies for the industry, coordinating to implement those policies, setting and enforcing industrial standards, providing technical services such as testing, calibrating and quality assurance, and market information, applying results from research to up grade technological capabilities and quality control system to the global standard, and finally developing high-caliber human resources for the industry. The institute is trying to act as an intermediary bringing in external technology and knowledge to upgrade technological capabilities of local suppliers. One of the important programs of the institute was Automotive Experts Dispatching Program (2003-2005) to bring Japanese experts to transfer key production technologies and skills, including those for mold and die design, and plant management to engineers and technicians of 200 Thai OEMs and REMs which joined the program. The program was a collaborative program between Thai and Japanese governments. Japanese experts were dispatched from Japan, including those who used to work for Japanese TNCs before (Thai Automotive Institute, 2006).

Vietnam regarded motorcycle industry as a “key industry.” However, it has never come up with comprehensive policy to develop the motorcycle industry⁶. Since the mid-1990s, individual policy instruments, such as import protection, incentives for foreign direct investment, and product quality and safety standards, were formulated in an ad hoc and often inconsistent manner. Involvement of different ministries such as Ministries of Industry, Trade, and Science, Technology and Environment and the lack of coordination between them are partly responsible for these problems. Frequent changes and weak enforcement have been noted by foreign companies as serious problems. To illustrate, despite the fact that imports of CBUs was controlled by import quotas up to 1998 and was prohibited from 1998, new and secondhand CBUs made in Thailand and Japan continued to be smuggled into Vietnam in large numbers. Recurrent complaints by the foreign companies about the Vietnamese government policies⁷ clearly demonstrate the general absence of trust between the government and foreign companies. Public-private collaboration in the motorcycle industry as seen in the case of Thailand did not emerge.

Supporting Knowledge-producing Agents

Given the size and significance of the automotive industry in Thailand, special education programs for the industry are very much needed. There are a few education programs for automotive industry. Chulalongkorn University’s Faculty of Engineering has the most recognized and specific one, as it offers B.E. in Automotive Engineering. A Thai-language program started in 1995. It produced 15 high quality graduates annually. Toyota has been providing significant support in terms of equipment and instructors. After graduation, many students were recruited by Toyota. Since 2005, the Faculty has offered an English-language program aiming at producing 100 graduates per year. The instructors came from both Thai and foreign academics as well as guest lecturers from the automotive industry (Boonchukosol, 2006).

Besides education, the linkages and knowledge flow between firms in motorcycle industry and education institutes in Thailand are rather weak and fragmented. Firms have linkages with individual faculty members than organizational linkages. The organizational linkages mostly limited to sending students to have internship with companies, testing and consultancy for solving basic production problems. In Thai universities, there are some research projects on automotive technologies but there is none specifically on ‘motorcycle technologies’, needless to say about the collaborative research between firms and universities (GMI, 2004).

⁶ In 2002, the Prime Minister promulgated the strategy for development of machinery industry up to the year 2020 (Prime Minister’s Decision 186/2002/QD-TTg dated December 26, 2002). Preparation of a specific strategy for development of motorcycle industry has been proceeding for the past few years, but to date the strategy has not come out.

⁷ There were numerous occasions when Vietnam’s policies towards the motorcycle industry received criticisms from companies, both foreign and local. The most prominent example was observed in September 2002, when the Vietnamese government suddenly announced the import quota for motorcycle companies for the whole year (“Motorcycle makers to send reps to Vietnam” *The Japan Times*, Oct. 10, 2002; “Japanese Automobile Association to visit Hanoi” *Vietnam Economic Times*, Oct. 15, 2002). Due to the sudden imposition quota, a number of foreign motorcycle companies that used up the quota, including Honda Vietnam and Yamaha Vietnam, had to temporarily stop their operations because they could not import parts.

The linkages with research and technological supporting organizations are insufficient but better than those with education institutes. For example, the Thai German Institute, the largest and most advanced training centre for industrial technologies in Thailand, provides technical services and course-based or tailor-made training to entrepreneurs in rather advanced technologies related design and production systems, especially in mold and die technology and computer-aided design and computer-aided manufacturing, automated production and precision machining (Thai German Institute, 2006). National Metal and Materials Centre (MTEC) under National Science and Technology Development Agency (NSTDA) has been conducting research quite relevant to the automotive industry such as finite elements, which can be used for designing many parts of motorcycle and automobile, computer-aided design, engineering and manufacturing, failure analysis and material degradation. It also provides testing and training services to the private sector in the aforementioned areas as well (National Metal and Materials Centre, 2006). As mentioned above, higher degree competition due to global sourcing strategies of TNCs and China's threats, the Thai companies are trying to forge more and deeper collaboration with local universities and research institutes.

In Vietnam, while formal education and training institutions targeting the demands of the industry remain insufficient, in-house training within foreign companies seems to have worked relatively well⁸. Hanoi and Ho Chi Minh City Universities of Technology, with programs on mechanical engineering, were cited as important sources of engineers for Japanese motorcycle manufacturers. The newly recruited engineers generally go through substantial in-house training for more practical skills as specific methods of management and requirements of Japanese companies. Most Japanese companies interviewed by the author emphasized the high quality of the Vietnamese engineers and workers, a key to improving the quality and production efficiency within the factory.

For Japanese motorcycle and parts companies in Vietnam, knowledge flows mainly originate abroad, especially their headquarters (research institutes) in Japan. For instance, Honda has regional R&D center in Thailand, which cooperates with headquarters in Japan closely in product development and design for Honda's subsidiaries in Southeast Asia. Honda's factory in Vietnam receives substantial technical support from the headquarters in Japan and R&D Center in Thailand, in launching new models, finding potential local suppliers and providing technical assistance to them, and so on.

Vietnam does not have a research institute specifically targeting the automotive industry, but has a few public research institutes engaged in the wider field of machinery industry. Among them, Research Institute of Technology for Machinery (RITM) under state-owned Vietnam Engine and Agricultural Machinery Corporation and Industrial Machinery and Instruments Holding (IMI) under the direct management of the Ministry of Industry are engaged in research and training in the fields closely related to the production of motorcycle parts, such as die casting, forging, metal stamping, testing, and production of molds and dies. In particular, IMI Holding has been successful in

⁸ This paragraph is based on author's interview with Honda Vietnam, Yamaha Vietnam, and several Japanese parts manufacturers in Vietnam.

upgrading the level of equipment and technology through assistance from international organizations and companies in developed countries⁹. However, even IMI is fraught with weaknesses such as limited linkages between its R&D and training activities and the actual demands in the industry. Virtually none of the companies surveyed by the author, including state-owned ones, had substantial linkage with the public research institutes.

Institutions

Institutions like laws, norms, routines, standards and so forth play important role in shaping behavior of agents and their interaction among each other. For example, one factor that somewhat explain the different of Thailand and Vietnam in terms of the increase in imports from China is the different ‘perception’ of consumers in both countries. In Thailand, motorcycles and their parts produced from China are perceived as products inferior to those produced locally. Japanese motorcycles have very established brand names. In Vietnam, foreign motorcycle brands are generally new to the consumers, with the exception of “Honda.” This is because secondhand Honda motorcycles, imported initially from Japan and more recently from Thailand, have been in the country for decades¹⁰. However, as of the late 1990s even Honda, not to mention other TNCs that entered Vietnam in the 1990s, had experienced difficulties in expanding its sales. The main reason was that the price (above US\$2,000) was too high for ordinary people. Japanese motorcycle companies had failed to notice the enormous “potential” demand for low-cost motorcycles for daily transportation. This missed opportunities have been grabbed by Chinese motorcycle companies.

Moreover, industrial standards concerning quality, efficiency, consumer safety and environment were introduced and enforced more strictly in Thailand. These, in effect, block inferior Chinese imports. Therefore, Chinese motorcycle/parts were not as successful as in Vietnam in penetrating into Thai market. On the other hand, in Vietnam, quality and environmental standards, safety regulations, and other policies were newly emerging and enforcement was seriously weak.

5. Evolution of the Sectoral Innovation System under China’s Threats and Opportunities

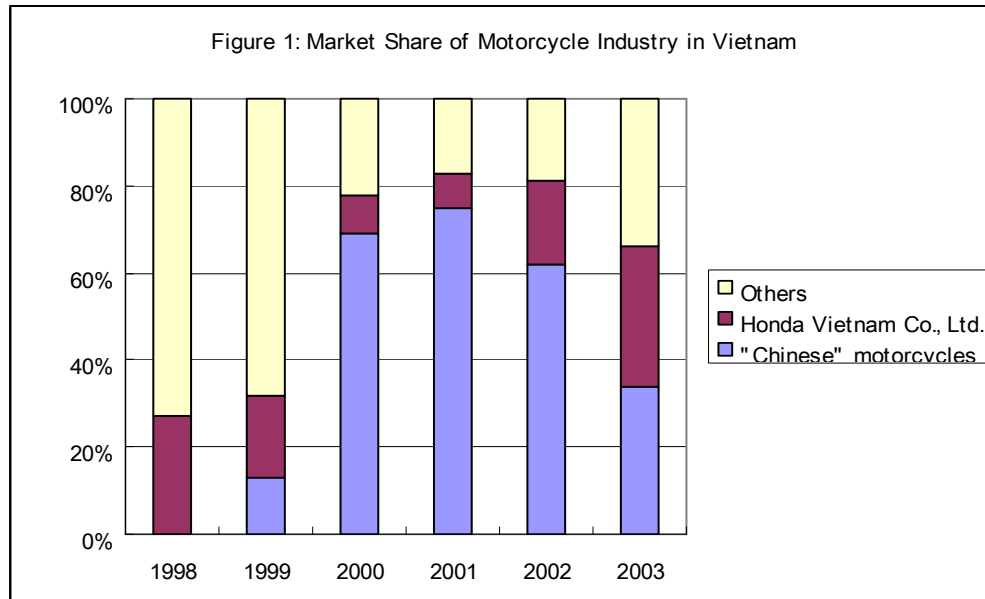
5.1 The extent of China’s impact on motorcycle industries in Thailand and Vietnam

As noted in Section 2, the “export drive” of Chinese motorcycle companies accelerated since the late 1990s. However, its impact differed significantly between Thailand and Vietnam. Table 3 shows that China’s exports of motorcycles and parts gradually increased in the early 2000s but remained insignificant. The market structure also

⁹ This remark was made by two Japanese engineering specialists who visited the company in 2001 under a project by Japan External Trade Organization (JETRO) aiming at strengthening supporting industry in Vietnam.

¹⁰ The first “Honda” boom in Vietnam took place in the 1960s, in the midst of Vietnam War. Tens of thousands of Honda Supercubs were imported into the country and used mainly by American military officers stationed in South Vietnam. After the reunification of the country in 1975, secondhand Honda Supercubs continued to be traded within the country, due to its remarkable durability, high fuel efficiency, and ease of maintenance and repair.

remained relatively stable, major Japanese TNCs keeping the lion's share (Table 1). In contrast, China's exports of motorcycles to Vietnam increased dramatically between 1999 and 2002. It reached over 1.8 million in 2001, more than triple the annual sales in the mid-1990s. In 2000, so-called "Chinese motorcycles," motorcycles assembled by Vietnamese companies using the knocked-down kits imported from China, accounted for nearly 80% of Vietnamese motorcycle market (see Figure 1), significantly reducing the share of Japanese motorcycle companies. The low-priced "Chinese motorcycles" significantly enlarged Vietnam's motorcycle market, changing it from "assets" to means of daily transport for ordinary people.



Notes: 1) "Chinese" motorcycles' include motorcycles assembled by Vietnamese companies mainly using parts imported from China.

2) 'Others' include: (a) motorcycles produced by foreign motorcycles assembling companies based in Vietnam other than Honda Vietnam (e.g., Vietnam Export Manufacturing Processing Co., Ltd. (VMEP; a subsidiary of Taiwan's Sanyang Motors), Vietnam Suzuki, and Yamaha Vietnam) and (b) imported motorcycles including those made by Honda's subsidiaries abroad (e.g., Thailand).

Source: Authors' interview at Honda Vietnam in September 2004.

The difference can be explained, first and foremost, by the difference in effectiveness of import controls by the respective governments. While Vietnam prohibited import of CBUs and imposed tariffs on parts according to the local content ratio, Chinese motorcycles were imported into the country by local traders, who claimed false local content ratio to evade tax. In Thailand, import controls were effectively enforced. Second, price differentials between the locally produced motorcycles and Chinese motorcycles were much larger in Vietnam than in Thailand. In Vietnam, the Chinese motorcycles were priced one-third or even one-fourth (around US\$500 to 800, compared to the US\$2,000 or over for Japanese brand motorcycles) of the motorcycles produced locally by Japanese motorcycle companies. Third, Japanese TNCs took much stronger hold of the market, in terms of brand diffusion and nation-wide distribution and service

networks, in Thailand than in Vietnam, reflecting the history of operation in the respective countries.

Table 3
China's Export of Motorcycles and Parts to Thailand and Vietnam

(1) Motorcycles Unit: number of motorcycles											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Thailand	378	6	84	1	361	384	1,041	13,054	14,706	15,906	39,158
Vietnam	3,801	2,417	861	548	89,778	1,229,195	1,833,073	284,194	31,193	25,466	68,203

(2) Parts Unit: Million US\$											
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Thailand Engines	0	0	0	0	0	0	0	3	9	6	8
Other part	1	2	2	2	2	4	5	8	12	10	17
Total	1	2	2	2	2	4	5	11	20	16	25
Vietnam Engines	0	0	0	0	0	5	50	80	23	46	31
Other part	0	0	0	1	2	19	35	52	36	46	32
Total	0	0	0	1	2	24	85	132	59	92	62

Notes: HS codes corresponding to each of the categories are as follows: motorcycles (8711), engines (840732) and parts other than engines (8714)
Source: World Trade Atlas.

5.2 How Thailand and Vietnam's sectoral innovation systems were transformed

Whereas data on imports, sales and market share demonstrate the difference in terms of the extent to which motorcycle industries in the two countries were affected by China's export drive, examination of the dynamics of the sectoral innovation system in the two countries provides much deeper insights into similarities and differences in the way different agents and institutions reacted to the new challenges. Generally, the longer presence of Japanese TNCs and higher indigenous technological and marketing capabilities of Thai assemblers and part suppliers making Thailand less vulnerable to China's threat.

Different types of firms behave differently when facing a common external factor. To Japanese companies in Vietnam and Thailand, China is undoubtedly a competitor. Here we can observe similarities in strategies within the same company across countries (i.e. Thailand and Vietnam) yet differences across companies, which reflect regional strategies of the TNCs. In the case of Honda, the company pursued a common strategy of launching low-priced models in both countries. In Vietnam, where the company's market share diminished sharply, "Wave α " was launched in January 2002 with the price nearly one-third of the company's previous models. In Thailand, where the company perceived "potential threat" from China, Wave 100 was launched June 2002¹¹. "Wave α " was developed mainly in the Thai factory of Honda (Thai Honda Manufacturing Co., Ltd.), which was Honda Vietnam's mother factory, in close collaboration with Honda R&D Southeast Asia in Thailand (Ohara, Tian and Lin, 2003). The model was developed using the engine and body of Honda's existing models, as well as low-priced Chinese parts to bring down production costs. The new low-priced models quickly gained popularity in both countries. Especially in Vietnam, Honda quickly recovered market share after 2002 (Figure 1). In contrast, Yamaha has pursued 'higher value added', with more emphasis on brand, design (for a new model), and quality in both countries, a strategy fundamentally different from Honda

¹¹ Interestingly, Honda did not launch low-priced models in Indonesia.

In terms of the local companies, we can observe clear differences between the two countries. For a more established Thai own-brand manufacturer like Tiger, China is viewed both as a competitor and an opportunity provider. To differentiate from Chinese motorcycles, Tiger is trying to produce higher-quality product for 'upper' market. It attempted to increase its own technological capabilities by doing setting up design and development department and starting collaboration with local universities and public research institutes. At the same time, some Chinese imported parts, not locally produced, were accepted. This gives Tiger flexibility in choosing the best parts for their motorcycles. For SME 007 Plus, impacts of China are quite substantial. It is a new group of part producers with rather low level of technological capabilities (relative to Tiger) and they cannot produce all parts by their members. Therefore, they decided to change their strategy from assembling the whole motorcycle with its own brand name to importing designed frame and major components which cannot be produced by its group's members such as engine and crush from China. The plan to produce the branded motorcycle has been postponed. Instead, the group moved downstream the value chain to recruit repair shops as members and try to modernize these shops by introducing new shop layout and modern management. By doing that, the group aims to stimulate demand from downstream (repair shops) members for components produced the group's upstream (manufacturing) members (Katikarn, 2006). The leaders of the group are very entrepreneurial and very capable in developing relationship with government agencies. The new movement to upgrade repair shops has got a financial support from National Innovation Agency and Department of Industrial Promotion (under the Ministry of Industry) and technical support from Faculty of Engineering, Kasetsart University. It also received financial support to develop a software program for managing its information system and supply chain, especially franchising, management from Software Industry Promotion Agency and Department of Business Development, Ministry of Commerce (see Intellectual Property Institute, 2006).

For part suppliers, there are differences between Japanese (pure-Japanese or joint ventures) suppliers and local (pure-Thai) suppliers. The local pure-Thai suppliers have lower technological capabilities than Japanese counterparts which have technological transfer from their mother companies in Japan. Also First-tier Japanese part makers in Thailand usually have long-term relationships with their customers (Japanese OBM). In some cases, engineers from Japanese OBMs were sent to co-develop parts or components manufactured by part makers or giving advice on how to upgrade production system but the cooperation has not reached the level of joint R&D which is mostly done in Japan. Undoubtedly, the threat from China is more intimidating for the pure-Thai suppliers especially the second-and third-tier ones.

In Vietnam, the surge of imports from China provided new opportunities for local businesses. Since Vietnam prohibited imports of CBUs from 1998 to 2003, Chinese motorcycles had to be imported as knocked-down parts, and had to be re-assembled in Vietnam¹². As the result over 50 local companies assembling imported Chinese

¹² Since assembled motorcycles could not be imported, Chinese motorcycles went through the Vietnamese customs as knocked-down parts. The parts were re-assembled by Vietnamese companies. But the Chinese customs statistics (Table 3) show that China's exports in the years 1999-2001 were in the form of

motorcycle parts emerged. However, they faced difficulties from 2002 onwards, when the Vietnamese government significantly strengthened regulations on motorcycle industry by the following measures: (1) stronger enforcement of import tariffs according to the local content ratio, (2) “standards for motorcycle manufacturing companies,” requiring, among others, in-house production of key parts, and (3) renewed quality and environmental standards. While many local companies left the industry, some local companies remained, investing in in-house production of parts. A few even started to develop own motorcycle brands and distribution networks.

These local companies continue to keep certain market share due to their price advantage vis-à-vis Japanese products (see Figure 1). Yet, accumulation of technological capabilities within these local companies is limited. First, unlike in Thailand, they have not succeeded in developing their own motorcycle models instead of ‘copies’ of Japanese models. Second, many are largely dependent on foreign partners for in-house production of parts, or largely use imported parts or parts produced by Chinese companies based in Vietnam. Among the companies interviewed by the author, Company A, one of the largest local motorcycle companies, whose production reached 200,000 units in 2004, was heavily reliant on the Chinese partner. The company’s basic strategy was: “the Vietnamese would look after the sales and management, while the Chinese engineers would take care of the production.” The company had a joint venture with a Chinese motorcycle company to produce motorcycle parts, where 50 Chinese engineers were stationed to assist Vietnamese workers in 2004, 2 years after the factory started operations. Company A also cooperated closely with Chinese parts companies located in the neighborhood. The close cooperation with Chinese partners enabled Company A to rapidly increase production and bring down the production cost. In contrast, Company B pursued more self-reliant strategy to avoid over-dependence on foreign partners. It has become clear, however, that upgrading its own technological level through trial-and-error is too time-consuming when it has to compete in a highly competitive market consisting of the powerful Japanese TNCs and numerous local companies. Against this background, Company B had to increase the use of imported parts from China in the recent years. The increased use of Chinese parts was widely observed among many local motorcycle companies. Table 2 also confirms that imports of engines and parts from China increased rapidly since 2003.

More positive developments, however, can be observed in motorcycle part production. As pointed out in Section 3.2, companies producing motorcycle parts in Vietnam were extremely limited prior to China’s export drive. However, the emergence of numerous local motorcycle companies created substantial demand for low-priced motorcycle parts, giving impetus to numerous local companies, previously producing motorcycle replacement parts, bicycle parts, or machinery parts, to enter into motorcycle parts production. While many of the new entrants are suffering from the falling demand due to the demise of the local motorcycle companies, some of these new entrants have managed to participate in the procurement networks of Japanese and Taiwanese TNCs mainly as

assembled motorcycles, suggesting that the motorcycles were knocked down mainly for the purpose of getting through Vietnam’s customs.

second-tier suppliers¹³. Two of the three second-tier suppliers interviewed by the author received regular assistance in production technology and quality controls either from the first-tier supplier or directly from the Japanese motorcycle company.

The analysis above suggests that the external threat from China, by inducing changes in firms' strategies and market environment, entry of new firms, creation of new inter-firm relationships, and changes in government policies, significantly transformed Vietnam's motorcycle sectoral system of innovation.

6. Conclusion

The above findings shed some lights on the evolution of sectoral system of innovation and production. Theoretical implication to the concept of sectoral system of innovation and production can be highlighted.

The same external factor can be both threats and opportunities that can influence the transformation of a sectoral system of innovation and production as shown in the cases of motorcycle sectoral systems of innovation and production in Thailand and Vietnam. Under such transformation 'new' types of agent, new inter-firm relationship, new types of collaboration between firms and non-firm agents can emerged while 'existing' ones can be strengthen, weaken or disappeared.

Different sectoral systems of innovation and production can evolve differently when they are facing similar threats and opportunities. The direction and the pace of evolution depends very much on existing capabilities of agents, strength of their linkages and their processes of collective learning to withstand the threats and exploit opportunities. To illustrate, Thailand can withstand the threats and exploit opportunities better than Vietnam (i.e., being more equal partners with Chinese part makers) because, despite still being rather weak and fragmented, its motorcycle sectoral system of innovation and production has 'relatively' more capable agents (i.e., longer-present and more technologically sophisticated TNCs, local champions who are own-brand manufacturers, government with more vivid and targeted government strategies for automotive sector, more sectoral-specific and active government supporting agencies, universities and research institutes) and 'relatively' more interaction especially knowledge transfer among agents.

An external factor, in this case being threats and opportunities from China, induces changes in strategies of agents, higher degree of interactions among agents and more variation in the sectoral system of innovation and production. For example, a Thai OBM producer, Tiger, and some locally-own suppliers were forced to make greater in-house effort in deepen their own technological capabilities and develop more outward-looking strategies such as forging collaboration with local universities and research institutes to

¹³ Six foreign parts suppliers based in Vietnam interviewed by the author (Japanese, Taiwanese and Korean first-tier suppliers) used an average of 27 second-tier suppliers, 22 of which were local companies. Majority of the second-tier local suppliers had newly entered into the production of motorcycle to supply parts to local motorcycle companies, and were located near the first-tier suppliers.

improve existing products and production processes in order to outperform Chinese competitors. Local entrepreneurs in Vietnam seized the opportunity by collaborating with Chinese firms to start new businesses as motorcycle part suppliers.

Given external threats and opportunities, firms in both countries do play more important roles than non-firm agents in transforming sectoral system of innovation and production. In the case of Vietnam, however, relatively weaker dynamic linkages between firms and non-firm agents such as universities and research institutes, allow firms to play even more decisive role in the transformation of the sectoral system.

While the direction and the capacities of the local companies to respond to the external threat were largely shaped by the capabilities of existing agents and institutions in the country, explaining the strategies of TNCs calls for a regional perspective. Honda, for instance, perceived what happened in Vietnam in 2000 to 2001 as a fundamental threat to the company's operations in Asia as a whole, which had to be countered by close collaboration between its subsidiaries in the region. The new low-priced model was developed mainly in the company's production and R&D bases in Thailand, and the new model was launched not only in Vietnam but also in Thailand, where China's impact was still only a threat. In contrast, Yamaha has tried to increase value added of their products through brand, design, and quality, a strategy common to both Thailand and Vietnam. The different strategies of the two Japanese TNCs also illustrate that even within the same sectoral system of innovation and production, different firms adopt different strategies and change differently when facing similar external factors.

Within the same sectoral system of innovation and production, while there might be an opportunity and a threat created from an external factor for many firms, the 'realization' of that opportunity and preventing that threat depends very much on firms' abilities to seize such opportunities and fending off threat. For instance, while the SME 007 Plus needed to postpone its plan to build the whole motorcycle under its own brand name, Tiger managed to survive and turn threat into opportunities to be able source some motorcycle parts from China. This can be achieved because its level of technological capabilities is higher than that of SME 007 (and relatively high comparing with Chinese competitor). For part suppliers, the ability to integrate into global production networks of TNCs is also an important factor in fending off the threat. In Vietnam, more accumulation and learning happen in local parts companies that are incorporated in to the procurement networks of TNCs as first- or second-tier suppliers.

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